



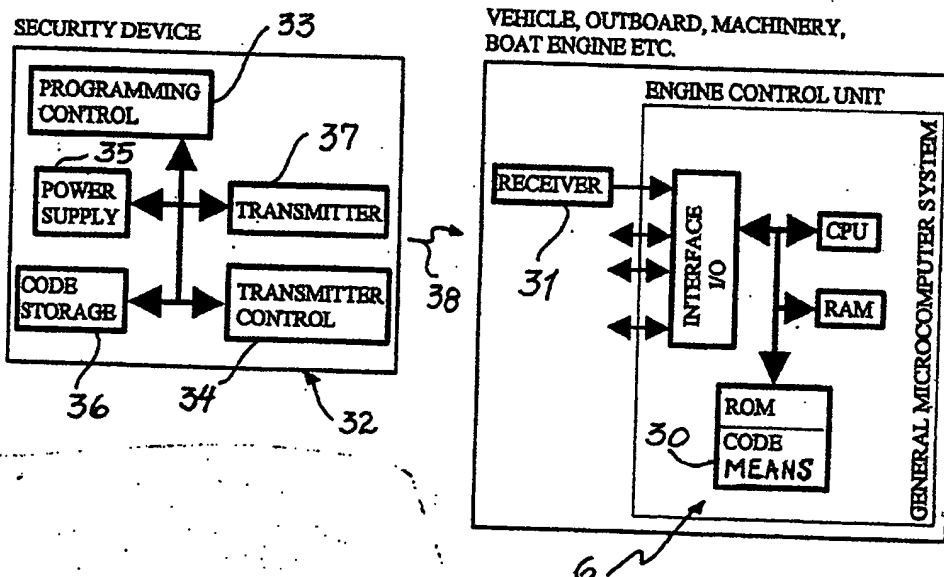
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(54) Title: ARRANGEMENT FOR PROTECTING AN ENGINE, ESPECIALLY A COMBUSTION ENGINE OR AN ELECTRICAL ENGINE



(57) Abstract

The present invention relates to an arrangement for protecting an engine, especially a combustion engine or an electrical engine, from unauthorized use or from being started, especially an engine to which is connected an electronically operated control unit, and in order to provide a security arrangement which so to say is impossible to temper with or bypass, it is, according to the invention, suggested that said arrangement comprises a code means (30) which is provided as part of said electronically operated control unit (6), and which code means (30) must receive a signal corresponding to a given security code (36) to allow starting or continuous running of said engine.

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ARRANGEMENT FOR PROTECTING AN ENGINE, ESPECIALLY A
COMBUSTION ENGINE OR AN ELECTRICAL ENGINE

Field of the invention

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The present invention relates to an arrangement for
protecting an engine, especially a combustion engine or an
electrical engine, from unauthorized use, especially an
engine to which is connected an electronically operated
10 control unit.

Prior Art

From GB 2.014.237 there is known a system for preventing
15 unauthorized use of vehicles, comprising a device for
controllably de-activating the starting system of the
vehicle. According to this prior art the device comprises a
series circuit including a step relay and a magnetic
20 contact, adapted to be influenced by an external magnetic
field, said circuit being supplied by the vehicle battery,
and said relay being operatively connected to an on/off
switch effective to switch on and off the entire electric
system or a portion thereof for thereby inhibiting the
25 engine starting when in the off condition. However, such a
device is readily accessible under the hood of an automotive
vehicle and can easily be set out of function by bridging
the on/off switch and breaking the connection to an
appropriate contact of said relay.

30 From GB 2.104.592 there is known a security device for a
vehicle ignition system, comprising a code reader in which
the vehicle user has to insert a code corresponding to a
preset code stored in a corresponding device, and a
comparator producing an output signal when the inserted code
35 and the preset code are in conformity. The output signal
closes a switch which in turn prevents a specific device and
a series connected secondary winding of the ignition coil
from reducing the output voltage from the secondary high

voltage winding of the ignition coil. Also this security system is readily accessible under the hood of the vehicle in question, and may easily be set out of function by cutting the conductor of the voltage reducing secondary winding of the coil transformer, and by shunting said switch connected in the primary circuit of said ignition coil, so as to provide battery voltage thereto.

Objects of the invention

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An object of the present invention is to provide a security system which in a more reliable and secure manner will prevent combustion engines or electrical engines or similarly operated articles from being used or operated without permission to do so.

15

Another object of the present invention is to provide a security system which makes it more difficult for such articles to be traded as stolen goods.

20

Still another object of the present invention is to provide a security system which in a more effective and secure manner renders vehicles immobile, i.e. protects vehicles in which such engines are found, from being started and driven away, and therefore still more difficultly being traded as stolen goods.

25

Yet another object of the present invention is to provide a security system which in a more effective and secure manner stops the motor when an emergency situation should occur.

30

Disclosure of the invention

The above objects are achieved in an arrangement as disclosed in the preamble, which according to the invention is characterized in that said arrangement comprises a code means which is provided as part of said electronically operated control unit, and which code means must receive a

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signal corresponding to a given security code to allow starting or continuous running of said engine.

5 Appropriately, said code means could be implemented in the software and/or the hardware of a microcomputer system of said control unit.

10 In a specific embodiment said code means could be implemented in a separate chip, which possibly could be embedded in a moulding compound.

15 It is to be understood that said arrangement further comprises a security device including means for storing and/or generating said given security code, as well as transmitter means for transmitting said security code to said code means of the control unit through an appropriate receiver means thereof.

20 The security device can appropriately be implemented as a handheld device, a local device, or as well as means integrated in keys, keypads, etc, said security device comprising a transmitter means for transmitting said given security code, and possibly further data, from said security device to said code means of said control unit through any
25 appropriate transmission medium, for example electro-magnetic fields, magnetic fields, optics, acoustics, direct contact, etc..

30 Further features and advantages in the arrangement according to the invention will appear from the following description taken in connection with the appended drawings.

Brief description of the drawings

35 Fig. 1 is a schematic view of a combustion engine designed for being monitored by an electronically operated control unit.

Fig. 2 is a block diagram of an embodiment of a control unit in which an arrangement according to the invention can be implemented.

- 5 Fig. 3 is a block diagram illustrating a general embodiment of an arrangement according to the present invention.

Fig. 4 is a block diagram illustrating a more elaborated embodiment of the present invention.

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Fig. 5 is a flow-diagram of a first implementation of the arrangement according to the present invention.

15

Fig. 6 is a flow-diagram of a second implementation of the arrangement according to the present invention.

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Fig. 7 is a flow-diagram of a third implementation of the arrangement according to the present invention.

Fig. 8 is a schematic diagram illustrating an example of component flow in a logistic system associated with the arrangement according to the present invention.

Detailed description of preferred embodiments

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In Fig. 1 there is schematically illustrated an example of a combustion engine which is designed for being monitored by an electronically operated control unit, a block diagram of an embodiment of such a control unit being illustrated in Fig. 2, both Figures being disclosed in Robert Bosch GmbH: Engine Electronics, Technical Instruction.

30

In the example illustrated in Figures 1 and 2, the combustion engine and its associated control unit is designed such that fuel injection and ignition can be controlled jointly and matched to another. In order to achieve this optimum operation every operating condition must be sensed by appropriate sensor means, see Fig. 1, for thereby

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applying corresponding signals to the control unit 6, which is further illustrated in Fig. 2.

5 The control unit 6 may comprise one or more printed boards which contain a microcomputer system, and in the block diagram of Fig. 2 it is illustrated how the input signals from the sensors are handled by the microcomputer system, and further how the output signals therefrom control the fuel injection as well as the ignition so as to provide
10 optimum engine operation.

Consequently, this type of combustion engine to which is connected an electronically operated control unit, could very well be provided with an arrangement according to the
15 present invention, i.e. an arrangement for protecting such a combustion engine from unauthorized use or from being started, and then by letting the arrangement comprise a code means which is provided as part of said electronically operated control unit, and which code means receive a signal
20 corresponding to a given security code to allow starting or continuous running of such control unit operated engine.

It is to be understood that the arrangement according to the present invention could be implemented in any type of
25 engines, especially combustion engines or electrical engines, provided an appropriate electronically operated engine control system is included in said engine. Further, it is to be understood that such an engine control system could manage any engine function which is necessary for
30 keeping the engine in question running, i.e. injection, ignition, emission, etc, and most appropriately the arrangement according to the present invention could be realized by implementing said code means in the software or the hardware of a microcomputer system of said control unit.
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Thereby, tempering with or bypassing of the security arrangement according to the invention would virtually be impossible when implemented in the engine control unit

computer program.

Fig. 3 illustrates as a block diagram of a general embodiment of an arrangement according to the present invention.

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To the right of Fig. 3 there is illustrated a first main block 6 corresponding to the control unit 6 in Fig. 1 and Fig. 2, the control unit thereof comprising a general microcomputer system in which is included a code means 30, said code means 30 being here illustrated as implemented in the software of the microcomputer system of said control unit 6. As an alternative, said code means could be implemented in a separate chip, which possibly could be embedded in a moulding compound.

15

Further, the engine control unit 6 in Fig. 3 comprises a receiver means 31 which is adapted to receive a signal corresponding to a given security code to allow starting or continuous running of the engine in question.

20

As further illustrated in Fig. 3, the left main block thereof constitutes a security device 32 including means for storing and/or generating said given security code, as well as transmitter means 37 for transmitting said security code to said code means 30 of the control unit 6 through said receiver means 31 thereof.

25

In the specific non-limiting example of the security device 32 illustrated in Fig. 3, the security device 32 comprises a block 33 allowing programming of the security code in the security device 32. The latter also comprises a block 34 which is a transmitter control adapted for initiating transmission of the security code when said security device is operated to enable such transmission, either automatically or manually by an authorized operator.

35

The block 35 designated power supply supplies energy to the different functions of the security device 32, said power

supply being constituted as a battery or any other type of energy source coupled directly or indirectly to the security device 32.

- 5 The block 36 which is designated code storage, stores the security code to be transmitted by the transmitter means 37 via any suitable medium as indicated by the arrow 38. Such medium may comprise electro-magnetic fields, magnetic fields, optics, acoustics, direct contact, etc, and it is to
10 be understood that the security device 32 itself could be any type of remote handheld device or a local device including appropriate means integrated in keys, keypads, etc.
- 15 In Fig. 4 which is a block diagram of a more elaborated embodiment of the present invention, the control unit 6, in addition to the code means 30 and receiver means 31, as in the embodiment illustrated in Fig. 3, also comprises an engine interface means 51, a general interface means 52, a
20 clock means 53, as well as a readout device 54.

This embodiment would enable the arrangement according to the present invention to perform further functions, for example:

- 25 • odometer interface
 • clock function
 • engine diagnostic
 • engine load profile
 • driving computer interface
30 • navigation system interface
 • alarm system
 • etc.

- 35 In Fig. 5 there is illustrated an example of a program flow-diagram of the security arrangement according to the present invention, when this security arrangement has been implemented in the engine control unit computer program. According to the flow-diagram of Fig. 5 the security

arrangement according to the invention inhibits unauthorized start of an engine, but if authorized starting has been accomplished, i.e. the appropriate security code has been received by the engine control unit, the started engine will
5 keep running without being interrupted by the control unit.

In Fig. 6 there is illustrated a flow-diagram of a second implementation of the security arrangement according to the present invention, the flow-diagram here allowing for
10 continuous running when receiving the correct code continuously, but being set to an emergency shut-down function when the engine control unit does not receive a signal which corresponds to the given security code, or alternatively
15 does not receive a signal at all. It is to be understood that the flow-diagram of Fig. 6 is readily implemented as a "dead man's button", i.e. stops the engine if the security device 32 is removed from a given position or its transmitter is inhibited from transmitting the given security code.

20 Fig. 7 is a flow-diagram of a third implementation of the security arrangement according to the present invention, in which the security arrangement inhibits unauthorized start of the engine in question if the security arrangement is
25 "armed" or enabled. The user may wish to "arm" or enable the security arrangement when it is desired to protect the engine in question or the vehicle in which the engine is installed, and may according to wish "disarm" or disable the security arrangement by means of the security device for
30 thereby letting the engine function as normally.

Fig. 8 is a schematic diagram illustrating an example of component flow in a logistic system, for example within the field of automotive industry, in which the present arrangement is implemented.
35

Accordingly, the logistic system of Fig. 8 illustrates a typical example of a manufacturer to user and service

facility sequence, in which the relevant components are shown in the left column of Fig. 8. Therein is illustrated an engine 40, for example an automotive engine, but any other engine to be used in a vehicle or as an outboard engine, or any machinery or engine product could also be included in such a system.

The above indicated engine 40 is to be used together with an engine control unit 6, in which the security arrangement according to the present invention is integrated in an appropriate manner, as this has been discussed above.

In the left-hand column there is also indicated a code card 42 which is a storage medium adapted to store the security code to be allotted to the engine in question and possibly including data identifying the owner of the engine.

A security device programmer 43 is used for transferring the security code of the code card 42 to the security device 32 which could be of the type as already indicated above, and which is to be used for transmitting the allotted security code to the engine control unit 6.

It is to be understood that the security code is a unique code comprising any number of figures and signs or symbols and is preferably to be generated by the manufacturer of the product to be protected, which code could possibly be altered or maintained depending on the level of protection to be included in the security arrangement of the present invention.

If a high level of security is aimed for, the unique code may be entered into a chip in the engine control unit 6, i.e. in the software thereof, and then in such a configuration that said code could not be read out therefrom, even if the security device programmer 43 should be stolen from the manufacturer.

Alternatively, the chip of the engine control unit 6 into which the unique code is to be implemented could be a single programming type chip. Consequently, the programming of this chip could be made only once, and further programming thereof would result in invalidation of the chip in question.

If the original code is stored in the security device 32, the corresponding code in the engine control unit 6 may be managed in several ways, and several code protection schemes may be offered, for example

- a) the code may not be altered,
- b) the code may only be altered using a master security code or master security device (special means),
- c) older codes may be erased when the security arrangement is set to code programming mode,
- d) programming is inhibited when a special disarm function is selected.

The code in the security device 32 may or may not be altered.

It is to be understood that the above examples can be extended or combined so as to provide varying levels of security, all in accordance with the field of application and user requirements.

Referring to Fig. 8, it is seen therein that the manufacturer combines the engine 40 and the engine control unit 6 for delivering this combined engine with engine control unit 41 to the user. Before delivery the code card 42 is used for inputting the unique security code in the associated engine control unit 6 as well as in the security device 32, this latter security device 32 also being delivered to the user. The code card 42 can be stored in a safe place, appropriately at the manufacturer, or possibly at the user for possible later use if for example additional security devices should be procured.

In the right-hand column in Fig. 8 it is illustrated how the engine control unit can only be sold to a registered owner of the engine in question, which means that a stolen engine with such an engine control unit could not be repaired or replaced in an illegal manner.

The versatility of the above described security arrangement can easily be expanded if parameters related to the use or operation of the engine are embedded in the engine control unit. In other words the code means of the control unit can constitute a part of a security arrangement, in which means are provided for allowing registration of parameters relating to the use of the engine in question, said security arrangement comprising output means for outputting any relevant such parameters to any display or reading device, for example as discussed in connection with Fig. 4 as discussed previously.

Such parameters can for example be related to

- a) hours of running, giving data for maintenance service and value of engine in question,
- b) last use and user of engine as well as time and date thereof, which parameters are to be registered by means of associated security arrangement identification data and time functions and possible geographical location.

The design of the security arrangement according to the present invention will ensure that such data may not be tempered with, which security system will give the owner a reliable and easily surveyable system as regards authorized and/or unauthorized use of the products in question. Such data can identify unauthorized use outside regular working hours, they may identify accidents and damages in relation to the products in question, as well as giving information about unauthorized attempts of starting the engine in question.

- Further, it is to be understood that the above security arrangement could be used in connection with an engine which is part of a vehicle having a vehicle alarm system included therein, and it would then be appropriate that said code
- 5 means of said control unit comprises means for operating in parallel with or through said vehicle alarm system, so as to protect said vehicle from unauthorized access thereto, as well as unauthorized running of the vehicle engine.
- 10 It is also contemplated that the above security arrangement could be used in connection with military equipment, in which the control unit may include an "arming means", for example as discussed above, which when being set to "armed" position requires the receipt of an "arm engine security
- 15 system" signal to accept said given security code, and which when not having been set to said "armed" position overrides said security code system.

P a t e n t c l a i m s

1. Arrangement for protecting an engine, especially a combustion engine or an electrical engine, from being started, especially an engine to which is connected an electronically operated control unit,
c h a r a c t e r i z e d i n t h a t s a i d a r r a n g e m e n t
comprises a code means (30) which is provided as part of said electronically operated control unit (6), and which
code means (30) must receive a signal corresponding to a given security code (36) to allow starting or continuous running of said engine.
2. Arrangement as claimed in claim 1,
c h a r a c t e r i z e d i n t h a t s a i d c o d e m e a n s (3 0)
is implemented in the software and/or the hardware of a microcomputer system of said control unit (6).
3. Arrangement as claimed in claim 1 or 2,
c h a r a c t e r i z e d i n t h a t s a i d c o d e m e a n s (3 0)
is implemented in a separate chip, which possibly is embedded in a moulding mass.
4. Arrangement as claimed in any of the claims 1 - 3,
c h a r a c t e r i z e d i n t h a t s a i d a r r a n g e m e n t
further comprises a security device (32) including means (34, 36) for storing and/or generating said given security code (36), as well as transmitter means (37) for transmitting said security code (36) to said code means (30) of the control unit (6) through an appropriate receiver means (31) thereof.
5. Arrangement as claimed in claim 4,
c h a r a c t e r i z e d i n t h a t s a i d s e c u r i t y d e v i c e
(32) is implemented as a handheld device, a local device, as well as means integrated in keys, keypads, etc, and that said security device (32) comprises a transmitter means (37) for transmitting said security code (36), and possibly

further data, from said security device (32) to said code means (30) of said control unit (6).

6. Arrangement as claimed in claim 4 or 5,
5 c h a r a c t e r i z e d i n that said transmitter means (37) comprises any suitable medium for transmitting coded signals, such medium comprising for example electro-magnetic fields, magnetic fields, optics, acoustics, direct contact, etc.
- 10 7. Arrangement as claimed in any of the preceding claims,
c h a r a c t e r i z e d i n that said given security code (36) is a unique code preferably generated by the
15 manufacturer of the product (40) to be protected, which code is stored in the code means (30) of the engine control unit (6) as a one time programming code.
- 20 8. Arrangement as claimed in any of the preceding claims,
c h a r a c t e r i z e d i n that the code in the code means (6) is adapted to be altered or maintained depending on the level of protection, for example comprising the following alternatives:
- 25 a) the code may not be altered,
b) the code may only be altered using a master security code or master security device (special means),
c) older codes may be erased when the security arrangement is set to code programming mode,
30 d) programming is inhibited when a special disarm or disable function is selected.
9. Arrangement as claimed in any of the preceding claims,
35 c h a r a c t e r i z e d i n that said code means (30) of said control unit (6) constitutes a part of a security arrangement in which means are provided for allowing registration of parameters relating to the use of the engine

in question, said security arrangement comprising output means for outputting any relevant such parameters to any display or reading device, for example parameters relating to:

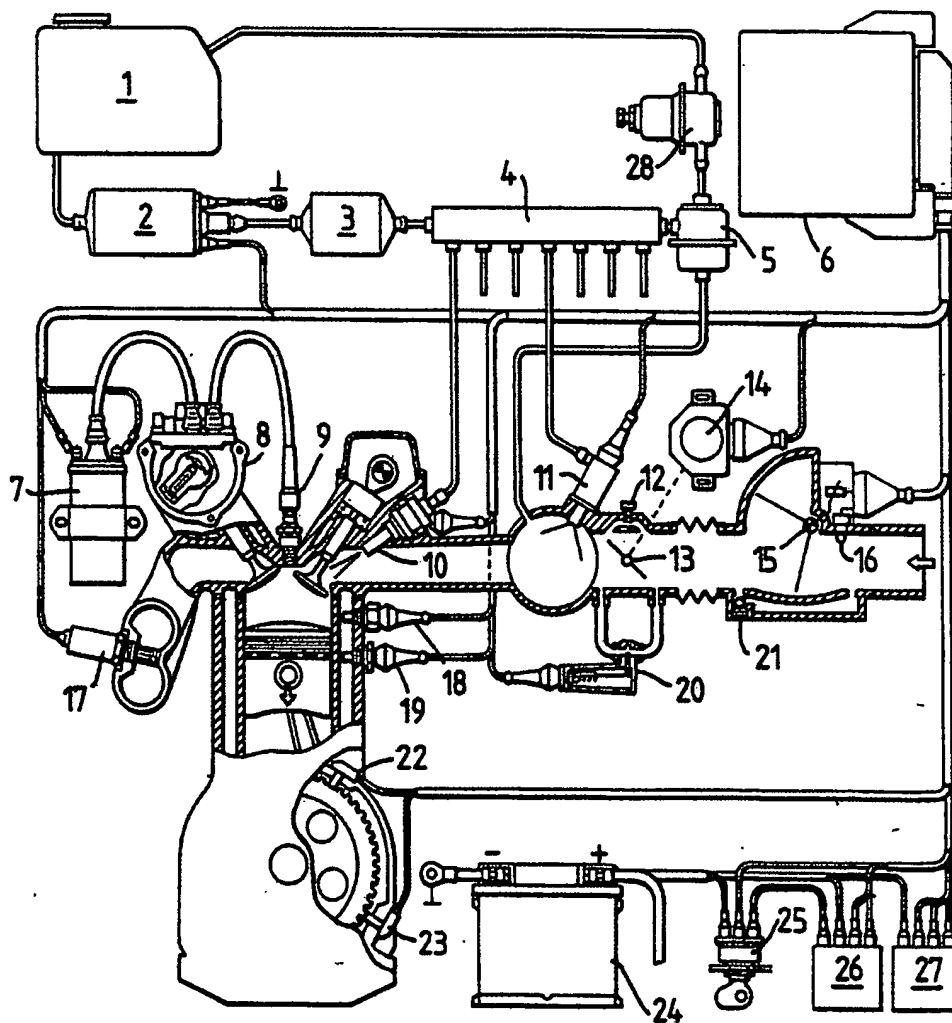
- 5 a) hours of running, giving data for maintenance service and value of engine,
 b) last use and user of engine and time and date thereof, which parameters are registered by means of associated security arrangement identification data and time
10 functions and possible geographical location.

10. Arrangement as claimed in any of the preceding claims,
c h a r a c t e r i z e d i n that the code means is
15 adapted to continuously receive a signal corresponding to a given security code for keeping the associated engine running (Fig. 6), and to indicated an emergency shut-down function of said engine when receiving no such security code or no signal at all.

20
11. Arrangement as claimed in any of the preceding claims,
c h a r a c t e r i z e d i n that the code means comprises an arming means (Fig. 7) which when having been
25 set to armed position requires the receipt of an armed engine security system signal to accept said given security code, and which when not having been set to said armed position overrides said security code arrangement.

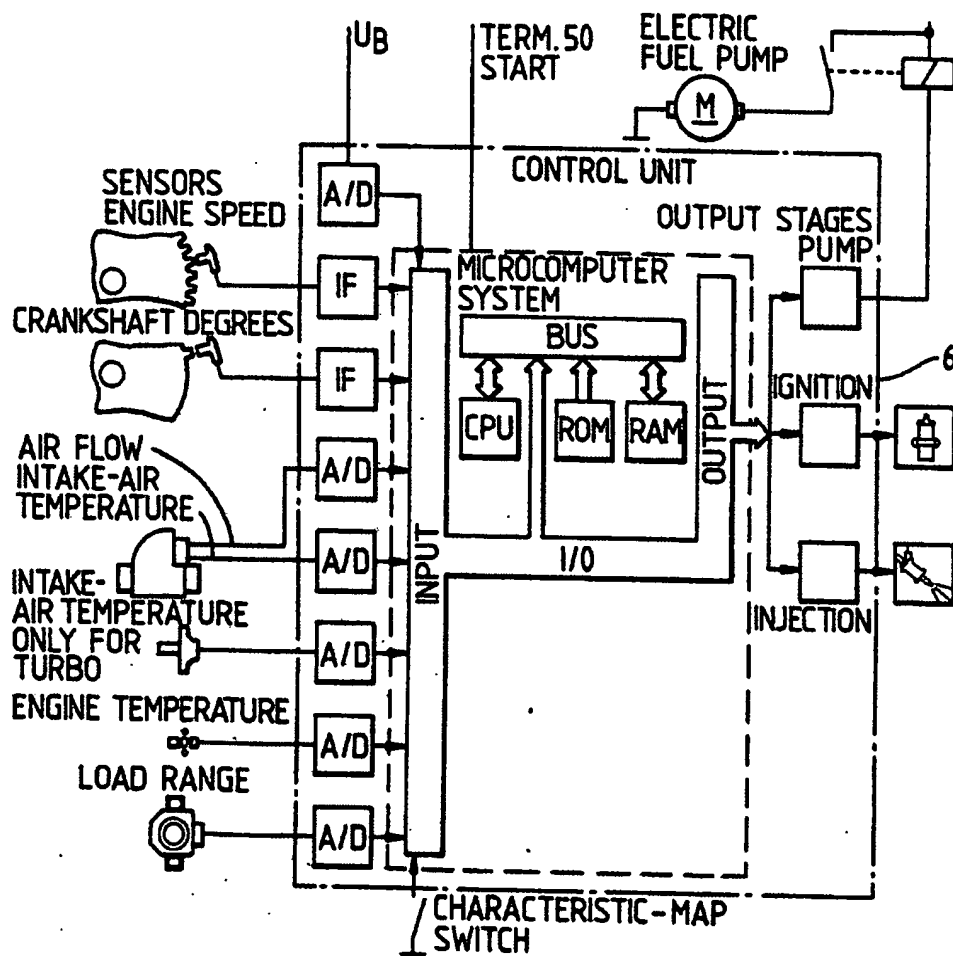
30 12. Arrangement as claimed in any of the preceding claims, especially in which said engine is part of a vehicle having a vehicle alarm system included therein,
c h a r a c t e r i z e d i n that said code means of said control unit comprises means for operating in parallel
35 with or through said vehicle alarm system, so as to protect said vehicle from unauthorized access thereto, as well as unauthorized running of said engine.

Fig.1.



SUBSTITUTE SHEET

Fig. 2.



SUBSTITUTE SHEET

VEHICLE, OUTBOARD, MACHINERY,
BOAT ENGINE ETC.

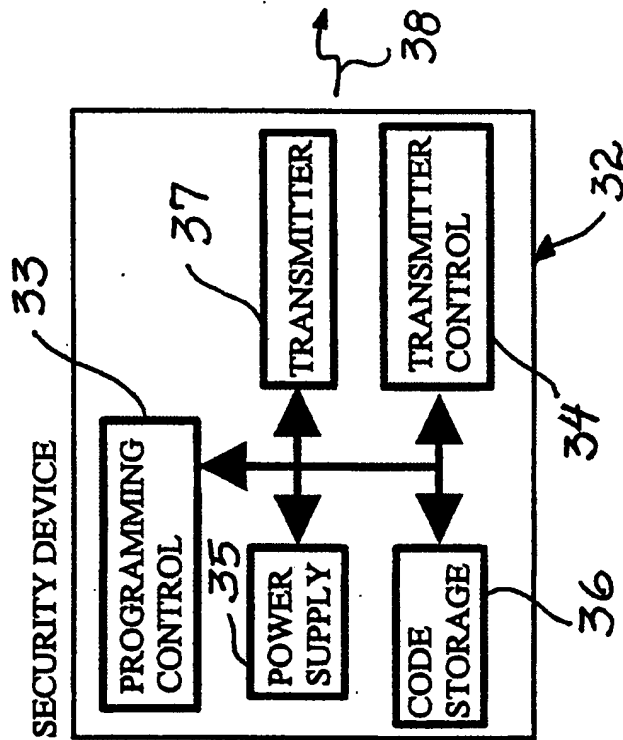
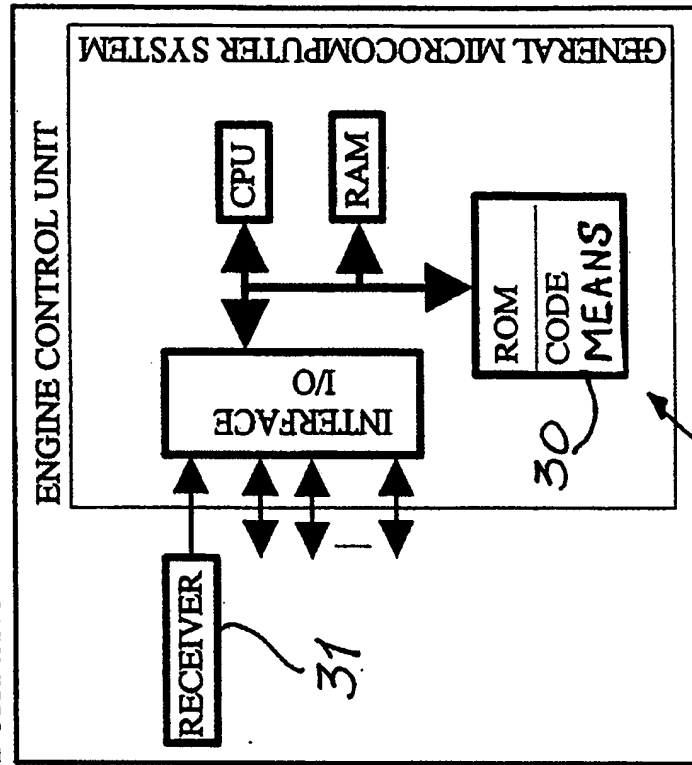
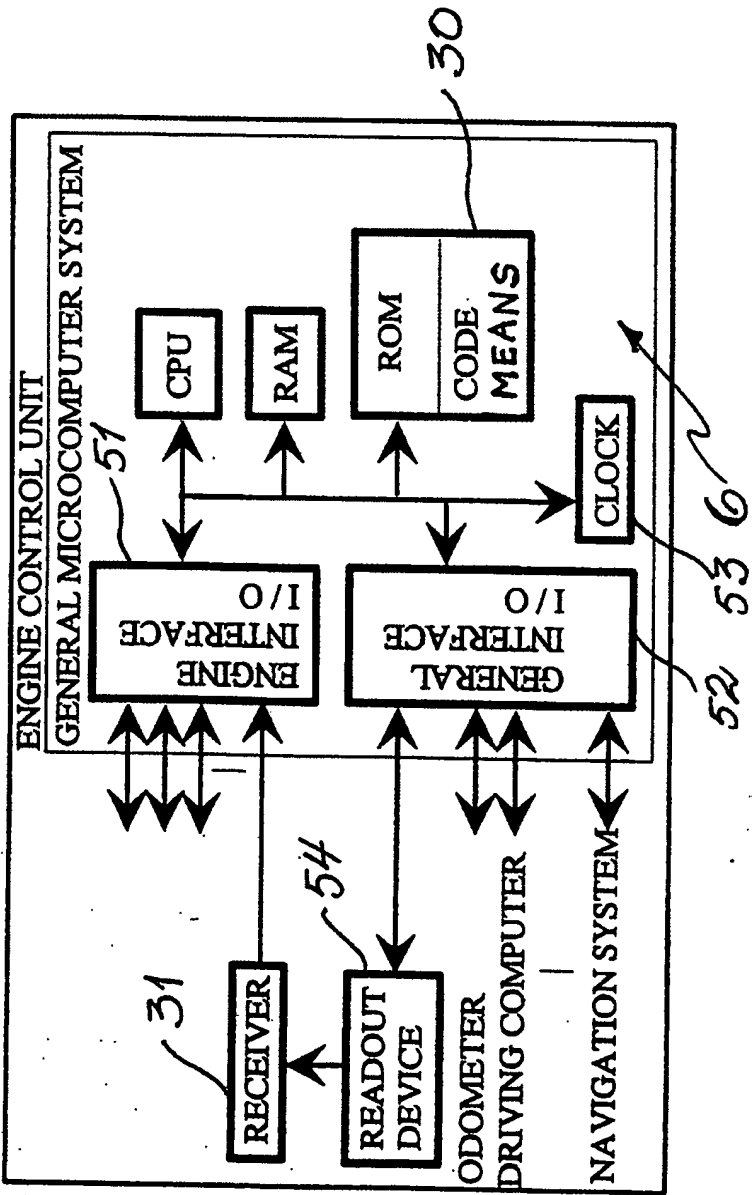


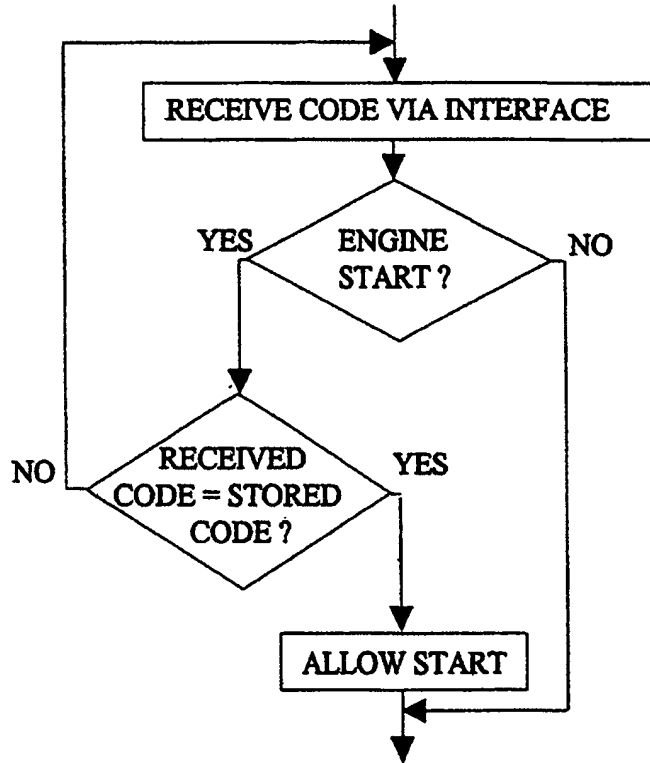
FIG. 3

FIG. 4

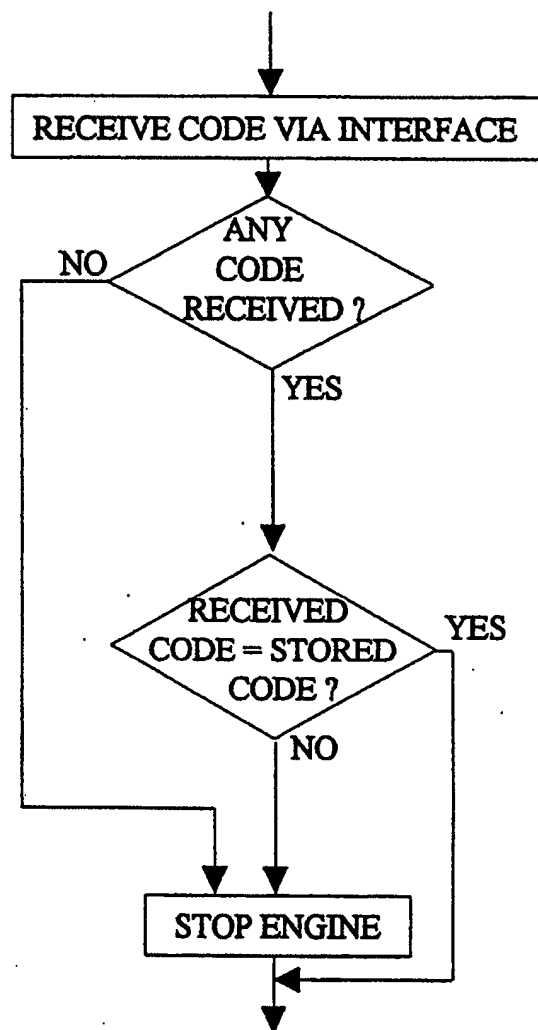
VEHICLE, OUTBOARD, MACHINERY,
BOAT ENGINE ETC.



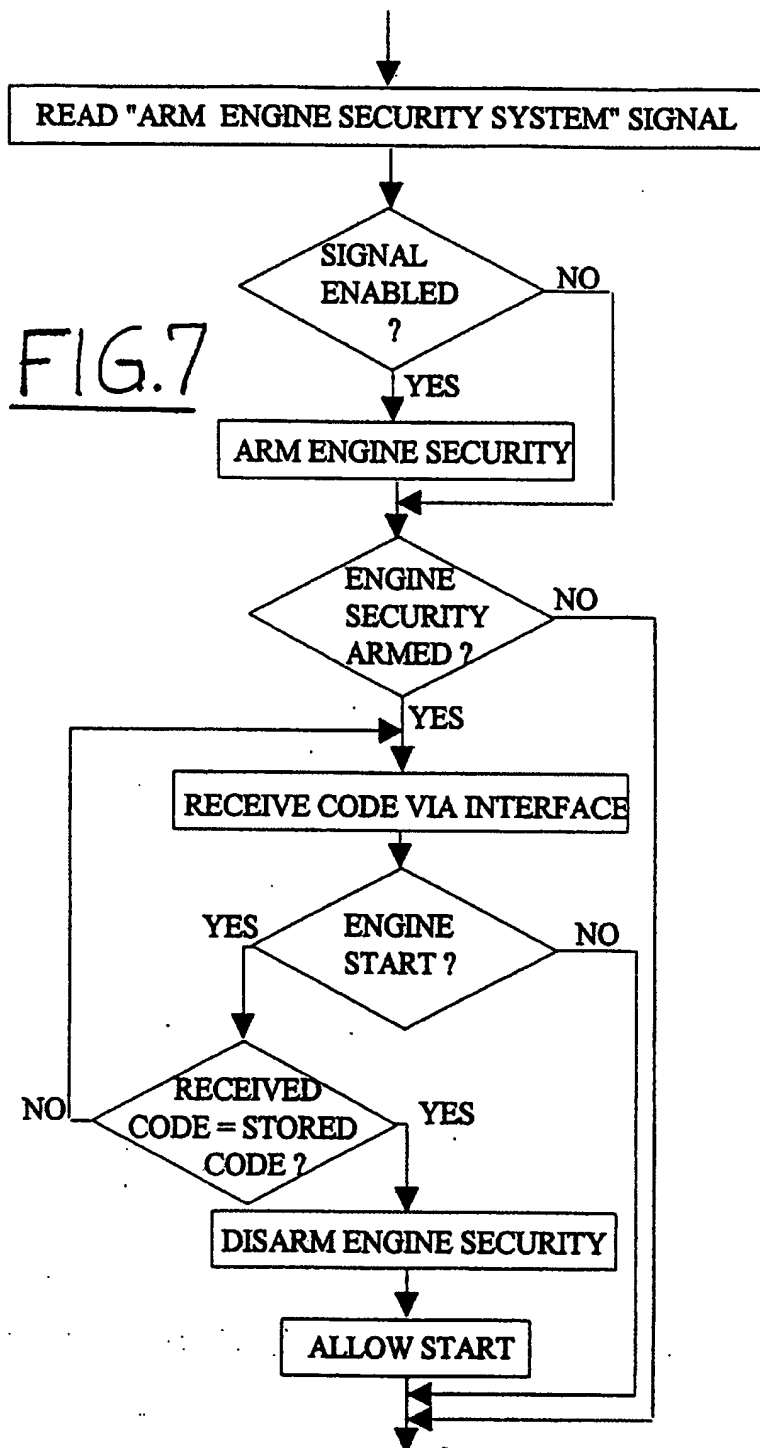
ENGINE CONTROL SYSTEM SECURITY FUNCTION

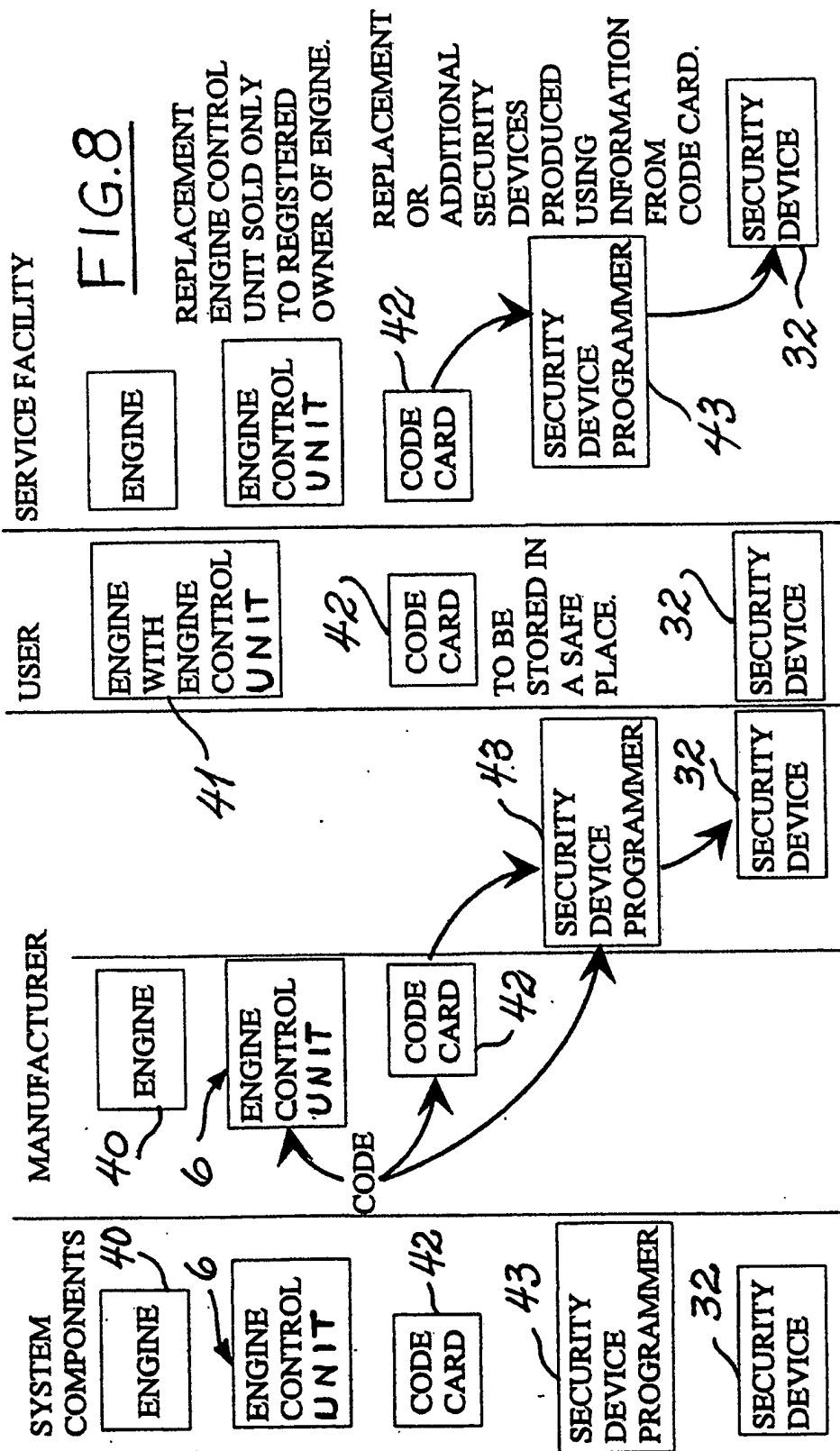
FIG.5

EMERGENCY SHUTDOWN FUNCTION

FIG.6

ARM ENGINE SECURITY FUNCTION





1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 92/00188

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: B60R 25/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO, A1, 803884 (ANDERSSON, OVE), 2 June 1988 (02.06.88), page 3, line 3 - page 8, line 7	1-8,11
Y	---	9,10,12
Y	EP, A1, 0393660 (KABUSHIKI KAISHA TOSHIBA), 24 October 1990 (24.10.90), column 3, line 22 - line 28; column 3, line 42 - line 48; column 6, line 29 - line 54	9,12
Y	WO, A1, 9202911 (GIROTTO, PIETRO), 20 February 1992 (20.02.92), page 2, line 4 - page 4, line 17	10

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

19 July 1993

Date of mailing of the international search report

21 -07- 1993

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 92/00188

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB, A, 2204542 (RUDY SANDERS, LEE FLEISHAM), 16 November 1988 (16.11.88); page 3, line 5 - page 7, line 1 -----	12

INTERNATIONAL SEARCH REPORT
Information on patent family members

02/07/93

International application No.

PCT/NO 92/00188

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO-A1-	803884	02/06/88	NONE		
EP-A1-	0393660	24/10/90	JP-A-	2279446	15/11/90
			US-A-	5124920	23/06/92
			JP-A-	2279447	15/11/90
WO-A1-	9202911	20/02/92	AU-A-	8310691	02/03/92
GB-A-	2204542	16/11/88	CA-A-	1306042	04/08/92
			DE-A-	3740638	08/12/88
			FR-A-	2615152	18/11/88
			JP-A-	63287644	24/11/88
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